

Orbit for the OD

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Financial Disclosure

- I have no relevant financial disclosures.

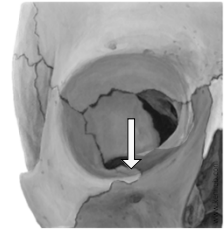
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ORBITAL ANATOMY

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Orbital walls

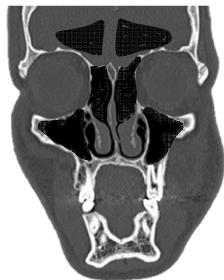
- Medial wall
 - Ethmoid bone's orbital plate is perforated and the thinnest orbital wall
- Lateral wall
 - Strongest wall of orbit
- Roof
 - Cranial vault's floor
- Floor
 - Thin bone along infraorbital canal increases susceptibility for blow-out fracture



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Adjacent Sinuses

- Maxillary
 - Beneath orbital floor
- Ethmoid
 - Adjacent to orbital wall
- Frontal
 - Above anterior orbits



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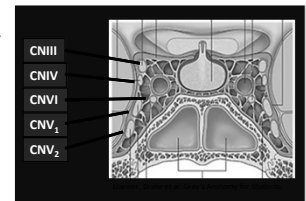
Adjacent Sinuses

Cavernous Sinus

- Communicating sinus on either side of the body of sphenoid
- Anteriorly opens into the SOF

Sphenoid

- Inferior to cavernous sinus



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EVALUATING ORBITAL DISORDERS

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5 “P”s of Orbital Disorders

1. Pain
2. Proptosis
3. Progression
4. Palpation
5. Periorbital changes

↑
The information you gather HERE forms your differential dx list.

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1. Pain

Pain on eye movement?

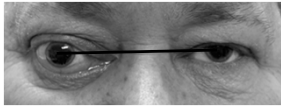
Tenderness?

Think: Muscle / tendon involvement
 Myositis
 Muscle entrapment
 Muscle contusion (s/p trauma)
 Optic neuritis


Think: Tender to palpation?
 Globe: Scleritis
 Upper lateral lid: Dacryoadenitis
 Lower medial lid: Dacryocystitis

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2. Proptosis



Axial
Mass *inside* muscle cone or enlarged extraocular muscles



Non-axial
Mass *outside* the muscle cone

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3. Progression

Rapid = Traumatic or inflammatory

- Retrobulbar hemorrhage, orbital fracture, carotid cavernous fistula
- Thyroid eye disease, idiopathic orbital inflammation, orbital cellulitis

Slow = Mass or tumor growth


- Dermoid cyst, cavernous hemangioma, optic nerve tumor, lymphoma




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4. Palpation

- Trauma
 - Step off fracture
 - Crepitus
- Resistance to globe retropulsion
- Indurated lesions/bony changes
- Pain
 - Lacrimal gland
 - Lacrimal sac



Tender palpable lacrimal gland in dacryoadenitis

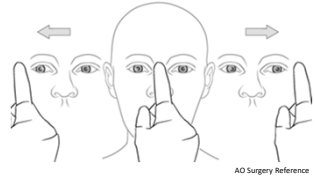


Post trauma, +resistance to retropulsion

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5. Complete eye exam

- Never underestimate the importance of the comprehensive exam!



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ORBITAL IMAGING

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Common imaging strategies

1. Orbital ultrasound (Echo or B scan)
2. Computed tomograph (CT)
3. Magnetic resonance imaging (MRI)

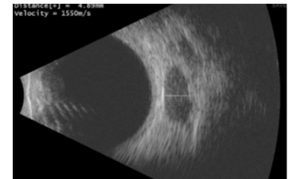
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Orbital Ultrasound

Quick, non-invasive, inexpensive ocular and orbital imaging system

Ideal for imaging:

- Ocular structures
 - Opacities, choroidal mass, etc
- Orbital structures
 - Muscles, lacrimal gland



Limitations:

- Incomplete orbit imaging
- Requires technical skill
- Difficult interpretation

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Computed Tomography (CT)

Utilizes X-rays to create image based on media density

Ideal for imaging:

- Trauma / fractures
- Thyroid eye disease
- Orbital cellulitis
- Fast and less expensive



Limitations:

- Not as good for soft tissue
- Not good for optic nerve

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Magnetic Resonance Imaging (MRI)

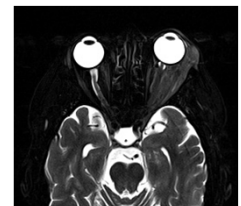
Images created from media biochemical properties (i.e. proton movement)

Ideal for imaging:

- Optic nerve inflammation
- Suspected tumors or mass lesions
- Orbital apex

Limitations:

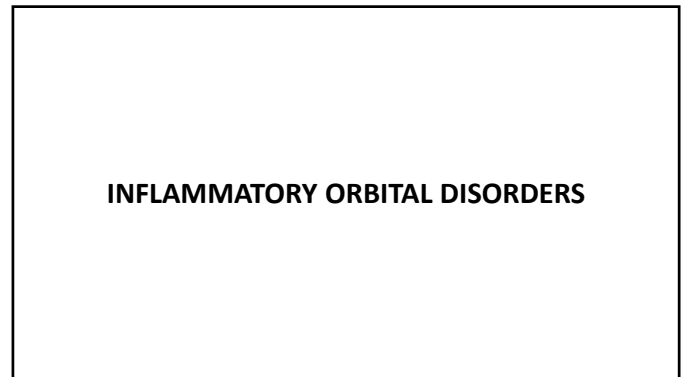
- Poor resolution for bone
- Do NOT use in suspected metallic foreign bodies, pacemakers, or certain types of vascular clips



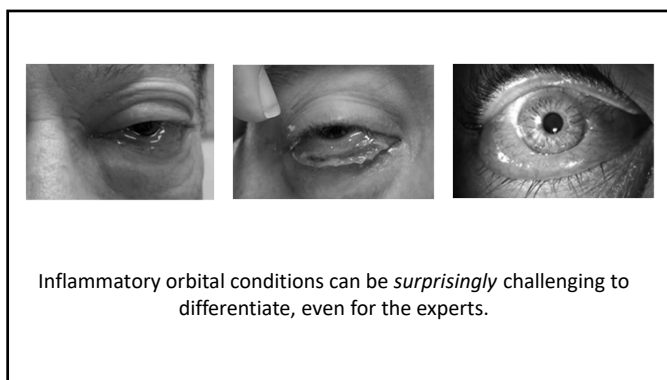
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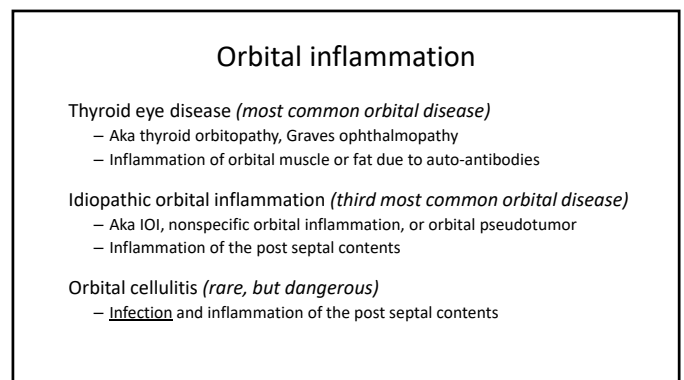
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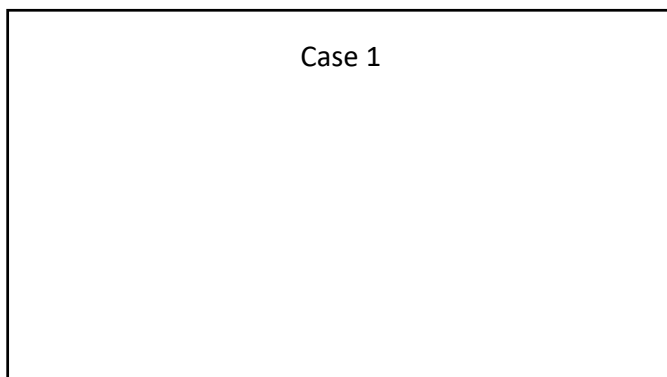
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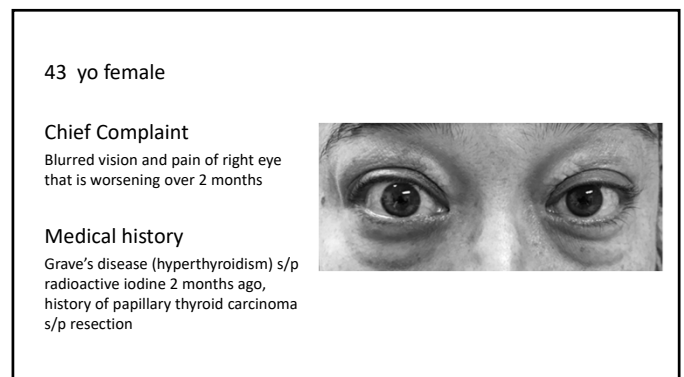
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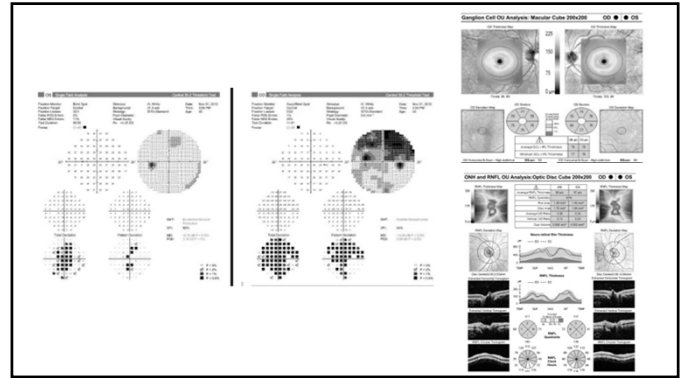
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	OD	OS
Visual Acuity	20/40	30/60
Pupils	No noted APD	No noted APD
EOMs	1 upgaze	1 upgaze
Color vision	4/14	14/14
IOP	20mmHg	18mmHg
Exophthalmometry	26mm	25mm
Fundus	Normal	Normal

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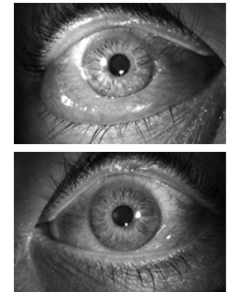
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Thyroid Eye Disease: Clinical features

- Proptosis
- Eyelid retraction
- Lateral lid flare
- Ophthalmoplegia
- Chemosis
- Injection
- Associations
 - Hyperthyroidism*
 - Female gender (6:1 to 10:1)
 - Bimodal age distribution: 40s and 60s
 - Smoking



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Thyroid Eye Disease: Lab Work Up

- Free T3
- Free T4
- TSH
- Thyroid auto-antibodies
 - Thyroid peroxidase antibody (TPO Ab)
 - Thyroglobulin antibody (Tg Ab)
 - TSH receptor antibody (TRAb)
 - Thyroid stimulating immunoglobulin (TSI Ab)
- Consider CT imaging for advanced cases

1. Seters MR, van Zeijl CJ, Boelen A, Kloos R, Saeed P, Vriessendorp TM, Mourits MP. Optimal management of Graves orbitopathy: a multidisciplinary approach. *Neth J Med.* 2011;69:302-308

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Thyroid Eye Disease: Management

Smoking cessation*

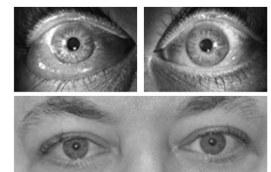
- Smoking cessation is the single most modifiable risk factor

Non-vision threatening

- Palliative treatment
- Oral steroid therapy

Referral to primary care physician or endocrinology

- Treatment of thyroid levels *does not* cure TAO
- In fact, radioactive iodine may hasten development of TED!



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Thyroid Eye Disease: Management

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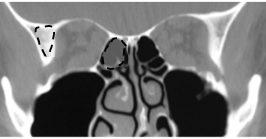
Vision threatening

- Urgent referral to Oculoplastics
 - IV or oral steroids
 - Orbital decompression
 - Orbital radiotherapy

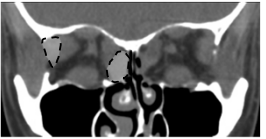
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Orbital Decompression

Before Decompression



After Decompression



Courtesy of Audrey Ko, MD

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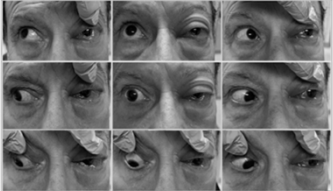
Case 2

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61 yo male

Chief Complaint
Left eye pain and swelling for 12 hours


Medical history
Non contributory





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VA 20/20 OD, 20/40 OS
No APD noted
Color vision full

Exophthalmometry
17mm OD / 22mm OS



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Left globe proptosis. Peri-optic nerve sheath soft tissue stranding along the retrobulbar fat extending to the orbital apex. No drainable collections are identified.


Differential would include peri-orbital and orbital cellulitis versus orbital pseudotumor.

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- No sinus disease
- No history of trauma or surgery
- Afebrile, otherwise well-feeling

Plan?

- 500mg IV methylprednisolone
- Already feeling better at day 1!
- Started on 60mg prednisone and ordered labs



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IOI: Clinical features

- Acute onset
- Pain
- Diplopia
- Periorbital edema
- Proptosis
- EOM restriction
- Red eye
- Chemosis
- Ptosis
- Decreased vision

Laterality

- Adults: unilateral (~80-90%)^{1,2}
- Children: unilateral or bilateral

1. Swamy BN, McCluskey P, Nemet A, Crouch R, Martin P, Benger R, et al. Idiopathic orbital inflammatory syndrome: Clinical features and treatment outcomes. Br J Ophthalmol. 2007;91:1667-70. 2. Mombaerts I, Cameron JD, Chantait W, Garrity JK. Surgical debulking for idiopathic dacryoadenitis: A diagnosis and a cure. Ophthalmology. 2014;121:603-9.

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IOI: Location location location

Classification by Anatomical Target	
Tissue	Name
Lacrimal gland*	Dacryoadenitis
Extraocular muscles	Myositis
Sclera and/or Tenon's capsule	Scleritis
Optic nerve sheath	Inflammatory optic neuritis
SOF and cavernous sinus	Tolosa-Hunt Syndrome

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“As IOI is a diagnosis of exclusion, patients must be evaluated to rule out any malignancy, infection, systemic inflammatory process, or other concomitant medical conditions.”

You can't diagnose IOI unless you are sure it's I.

- Rule out neoplasm
- Rule out orbital cellulitis
- Rule out any inflammatory or infectious disorder
 - (Think of a uveitis work up)

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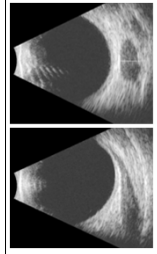
IOI: Work Up

Obtain imaging first

- What type?

Then labs

- Basics: CBC/diff, ESR, CRP
- Thyroid: TSH, T3, T4
- Rheum: ANCA (GPA!), ANA, ACE, IgG4
- Consider infectious: RPR, FTA, PPD/Quantiferon



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IOI: Management

1. NSAIDs
 - First line treatment for mild cases
 - Ex: 800mg ibuprofen tid PO x 1 week
 - Remember proton pump inhibitors
2. Corticosteroids
 - Rule out infectious etiology first!
 - Oral, intravenous
 - Ex: 1 mg/kg prednisone in adults, slow taper past 40mg
3. Immunomodulatory and biologic agents
 - Azathioprine, methotrexate, cyclosporine, etc
 - Infliximab, adalimumab, tocilizumab, etc
4. Others..
 - External beam radiation
 - Plasmapheresis
 - IVIG

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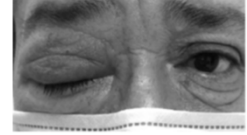
Case 3

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60 yo male

Chief Complaint

Right eyelid swelling and pain for 4 days

Medical historyType 2 DM, poorly controlled
Denies trauma or recent surgery

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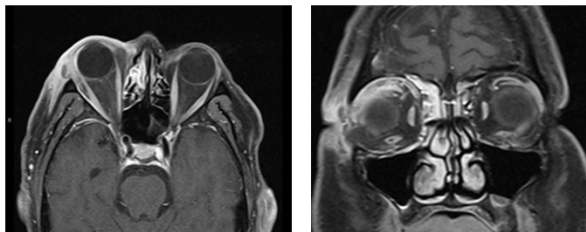
- VA 20/30 OD, 20/40 OS
- No APD
- IOP wnl
- Hertel 19mm/21mm
- EOMs?



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What next?

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Orbital Cellulitis: Red Flags

A dozen red flags?! I love them!





- Acute onset
- Proptosis
- Pain
- Diplopia
- Ptosis
- Vision loss
- Conjunctival chemosis and injection
- Fever
- Sinusitis symptoms

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Orbital Cellulitis: Risk Factors


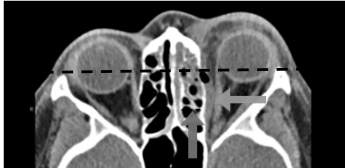
- Adjacent structures
 - Sinusitis*
 - Hordeolum
 - Dacryocystitis
- Recent ophthalmic surgery or trauma
 - Strabismus, blepharoplasty, etc
 - Orbital fracture
- Skin trauma / infected insect bites
- Local or systemic infection
 - Middle ear, tooth infection, etc
 - Hematogenous spread

Pre septal cellulitis after injury with vegetative matter

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Orbital Cellulitis: Diagnosis

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Orbital Cellulitis: Diagnosis

Begins with imaging

- CT* or MRI orbit
- Sinus disease is of high concern

Admission

- Surgical intervention indicated for subperiosteal abscess
- IV antibiotics 3-5 days
- Discharge with oral antibiotics

Branson SV, McClintic E, Yeatts RP. Septic Cavernous Sinus Thrombosis Associated With Orbital Cellulitis: A Report of 6 Cases and Review of Literature. Ophthalmic Plast Reconstr Surg. 2019;35(3):272-280.


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Case 4

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90 yo female


Chief Complaint
Painless progressive vision loss, 1 year OS
Vision did not improve with cataract surgery...



Medical history
Non-contributory

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- 20/40 OD, NLP OS
- Dense APD OS
- EOMs grossly full

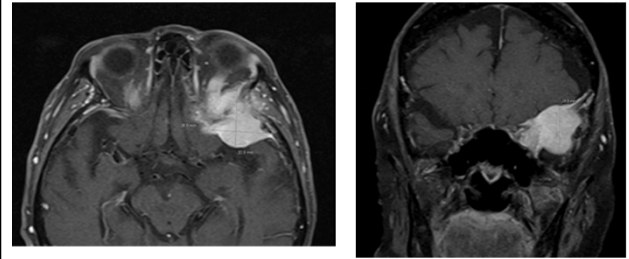


- Hertel 14mm OD / 18mm OS

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Next step?

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Orbital Tumors

- Heterogeneous group of space-occupying lesions located within the orbit
- While some tumors are benign and slow-growing, others may progress quickly and portend a poor prognosis
- The hard part is knowing the difference..

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Orbital Tumors

1. Vasogenic
2. Lymphoproliferative
3. Sinus originated
4. Optic nerve-originated
5. Lacrimal gland
6. Metastatic

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1. Vasogenic

- Cavernous hemangioma
 - Congenital, encapsulated mass of dilated blood vessels
 - May cause slowly progressive, painless, unilateral proptosis
 - Intraconal location
 - Women > men
- Venous, lymphatic, arteriovenous malformation



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2. Lymphoproliferative

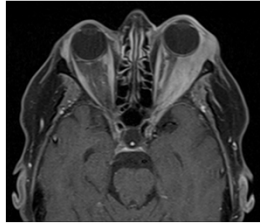
- Ex: Lymphoma, Lymphoid hyperplasia
- 20% of all orbital tumors
- Gradual, painless proptosis
 - Does not cause CON or muscle restriction until later because it molds to tissues of the orbit



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2. Lymphoproliferative

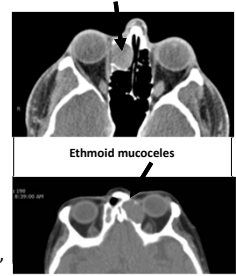
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3. Sinus originated (Mucocele)

- Expansive collection of mucoid secretion causing bony distension
- Symptoms
 - Sinus congestion, periorbital swelling
 - Proptosis or diplopia with intraorbital extension
- Risk factors:
 - Sinus infection/inflammation (77.5%), trauma, surgery, or tumors^{1,2}

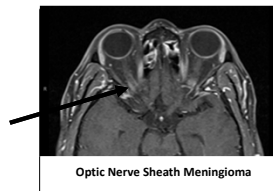


¹ Scarpas GA, Guoli DA, Kennedy DW. The natural history and clinical characteristics of paranasal sinus mucocoeles: a clinical review. *Int Forum Allergy Rhinol.* 2013;3:712-717. ² Arrud P, Kaly MT, Serrano E, Lacroix F, Perceval J, Yankov E, Pessier JJ, Marville C. Mucocoeles of the paranasal sinuses: uncommon location. *J Laryngol Otol.* 1998 Sep; 112(9):840-6.

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4. Optic nerve-originated

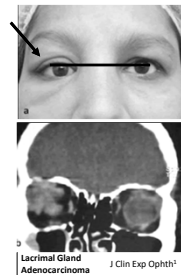
- Slow, painless, unilateral loss of vision
- Ex:
 - Optic nerve sheath meningioma
 - Optic nerve glioma
 - Schwannoma



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5. Lacrimal gland

- Lacrimal gland tumors can displace the globe
- Often cause bony remodeling
- Ex: Adenoma, Adenoid cystic carcinoma

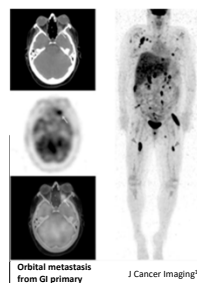


¹ Puthier N, Hada M, Koliyap S, Bujic MS (2015) Primary Ductal Adenocarcinoma of the Lacrimal Gland: Report of a Case and Review of Literature. *J Clin Exp Ophthalmol* 4:468. doi:10.4172/2155-9570.1000468

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6. Metastatic

- Most common
 - Breast, lung, prostate, and invasive squamous cell carcinoma
- 20% do not have known primary site at time of diagnosis



¹ Muzaffar R, Shousha M A, Sarajic L, & Osman M M (2013) Ophthalmologic abnormalities on FDG-PET/CT: a pictorial essay. *Cancer Imaging.* 13(1), 100-112. <http://doi.org/10.1102/1470-7330.2013.0010>

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Orbital Tumors

Signs and symptoms may include:

- Proptosis* and/or globe displacement
- Conjunctival chemosis or injection
- Extraocular muscle restrictions
- Afferent pupillary defect
- Periorbital edema
- Optic disc edema
- Vision loss

*Up to 10% of breast carcinoma metastases may have enophthalmos

¹ Muzaffar R, Shousha M A, Sarajic L, & Osman M M (2013) Ophthalmologic abnormalities on FDG-PET/CT: a pictorial essay. *Cancer Imaging.* 13(1), 100-112. <http://doi.org/10.1102/1470-7330.2013.0010>

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Orbital Tumors

If orbital mass suspected

- CT or MRI should be ordered
- Be sure to give clinical details on *why* you're ordering!

Referral

- Include exam summaries and imaging results/CD
- Oculoplastics, neuro-ophthalmology
- May consider otolaryngology for some cases

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Thank you for “orbiting”
with me!

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